

## PATENT ABSTRACTS OF JAPAN

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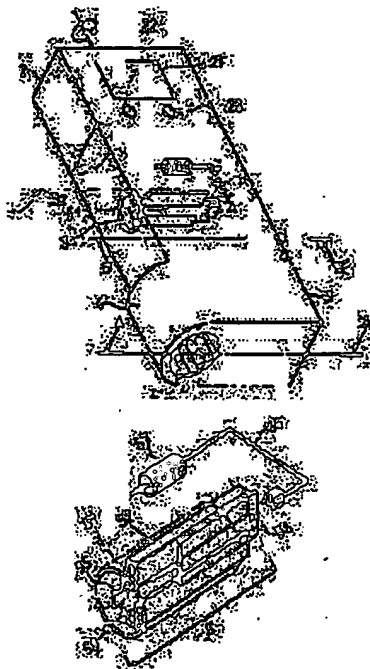
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OKA MOTOHIRO

## (54) BLOOD-ANALYZING APPARATUS

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To easily collect blood not by sucking thereby to analyze blood simply and quickly, by constituting a blood-analyzing device of a blood collection mechanism, a piercing member, an electrode and a display part, and congesting a finger with blood by the blood collection mechanism to collect blood.

**SOLUTION:** A main switch 22 is turned on and a finger is inserted in a tightening member 41 of a blood-collecting member 3. A display member 2 is rotatable to the member 3. Therefore, the display member 2 can be rotated into a state easy to see even when a right finger or a left finger is inserted in the member 41. When a piercing blade projection switch 23 is turned on, an electromagnet 57 is driven, and a piercing needle 53 is projected from a projecting part 55 of a base body 52 via an arm member 56 to cut the skin of the finger tip. Then, the piercing needle is returned to the original position by the action of a leaf spring 58. At the same time, the member 41 is driven, so that the finger is congested with blood which is squeezed out and brought in touch with an electrode of the projecting part 55. A substance to be detected in the blood is sent as an electric signal to a sensor, and a measured value is displayed at a display screen 21.



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CLAIMS

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[Claim(s)]

[Claim 1] Hemanalysis equipment with which a blood collecting device, a puncture member, an electrode, and a display are provided, and said blood collecting device is characterized by having the means made congested.

[Claim 2] Hemanalysis equipment according to claim 1 characterized by said puncture member and electrode being a cartridge-type.

[Claim 3] Hemanalysis equipment according to claim 1 or 2 characterized by installing said electrode in the location which contacts the blood which bled in the condition that the body was equipped with hemanalysis equipment.

[Claim 4] Hemanalysis equipment according to claim 2 or 3 which the base of a cartridge has tabular, and the puncture member is prepared in one side possible [ sliding ], and is characterized by arranging the electrode in an another side side.

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**TECHNICAL FIELD**

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[Field of the Invention] This invention relates to the hemanalysis equipment which possesses all of a blood collecting device, a puncture member, an electrode, and a display especially about the hemanalysis equipment which can analyze the detected matter contained in blood, such as the blood sugar level.

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PRIOR ART

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[Description of the Prior Art] Conventionally, when the blood sugar level etc. was measured, it was carrying out by making the blood drop adhere to the electrode with which attached the blemish to the fingertip using the reusable puncture instrument (Lancet), pressed out the blood drop from there, picked out from the wrapping material, and the sensor was equipped. However, when the reusable puncture instrument and the sensor have dissociated in this way, there are many processes which are required in performing a series of actuation.

[0003] Then, the blood collecting machine (refer to JP,5-95937,A and JP,5-95938,A) with which the blood collecting machine (refer to JP,5-111476,A, JP,6-311980,A, JP,6-327655,A, and JP,7-51251,A) with which the medical-application system (refer to JP,61-286738,A) by which the reusable puncture needle, the capillary tube, and the sensor were united, a reusable puncture needle, a suction implement, and \*\*\*\*\* were united and a reusable puncture needle, a suction implement, \*\*\*\*\*, and a sensor were united was proposed.

[0004] However, the blood collecting approach in these instruments It is what is depended on the method with which all are decompressed by the syringe, a syringe, etc. and attract blood. unless it sticks the base of a cylinder on the skin, it cannot decompress, but when the cylinder below phi1.5 mm is used, blood plugs up a hole with the former, there is a fault of bleeding stopping, and the structure of a syringe is complicated in the latter - etc. - there was a fault.

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**EFFECT OF THE INVENTION**

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[Effect of the Invention] According to this invention, it can collect blood easily by the approach by suction, and blood can be analyzed that it is simple and quickly.

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TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] The technical problem of this invention is offering the convenient hemanalysis equipment which has the device it collecting blood by the approach by suction, and possesses a puncture member, an electrode, and a display.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the hemanalysis equipment which possesses all of a blood collecting device, a puncture member, an electrode, and a display especially about the hemanalysis equipment which can analyze the detected matter contained in blood, such as the blood sugar level.

[0002]

[Description of the Prior Art] Conventionally, when the blood sugar level etc. was measured, it was carrying out by making the blood drop adhere to the electrode with which attached the blemish to the fingertip using the reusable puncture instrument (Lancet), pressed out the blood drop from there, picked out from the wrapping material, and the sensor was equipped. However, when the reusable puncture instrument and the sensor have dissociated in this way, there are many processes which are required in performing a series of actuation.

[0003] Then, the blood collecting machine (refer to JP,5-95937,A and JP,5-95938,A) with which the blood collecting machine (refer to JP,5-111476,A, JP,6-311980,A, JP,6-327655,A, and JP,7-51251,A) with which the medical-application system (refer to JP,61-286738,A) by which the reusable puncture needle, the capillary tube, and the sensor were united, a reusable puncture needle, a suction implement, and \*\*\*\*\* were united and a reusable puncture needle, a suction implement, \*\*\*\*\*, and a sensor were united was proposed.

[0004] However, the blood collecting approach in these instruments It is what is depended on the method with which all are decompressed by the syringe, a syringe, etc. and attract blood. unless it sticks the base of a cylinder on the skin, it cannot decompress, but when the cylinder below phi 1.5 mm is used, blood plugs up a hole with the former, there is a fault of bleeding stopping, and the structure of a syringe is complicated in the latter -- etc. -- there was a fault.

[0005]

[Problem(s) to be Solved by the Invention] The technical problem of this invention is offering the convenient hemanalysis equipment which has the device it collecting blood by the approach by suction, and possesses a puncture member, an electrode, and a display.

[0006]

[Means for Solving the Problem] By adopting the blood collecting device in which it has the means which this invention person etc. makes congested in view of the above-mentioned technical problem as a result of wholeheartedly research, even if not based on the suction approach, it could collect blood easily, and a header and this invention were completed for the ability of blood to be analyzed that it is simple and quickly.

[0007] That is, this invention possesses a blood collecting device, a puncture member, an electrode, and a display, and is hemanalysis equipment with which said blood collecting device is characterized by having the means made congested. Moreover, this invention is the above-mentioned hemanalysis



equipment characterized by the puncture member and the electrode being a cartridge-type. Furthermore, this invention is the above-mentioned hemanalysis equipment characterized by installing said electrode in the location in contact with the blood which bled in the condition that the body was equipped with hemanalysis equipment.

[0008] The base of a cartridge has tabular, the puncture member is prepared in one side possible [ sliding ], and this invention is the above-mentioned hemanalysis equipment characterized by arranging the electrode in an another side side further again.

[0009]

[Function] With the hemanalysis equipment of this invention which has the device in which it collects blood with the means made congested, and possesses a puncture member, an electrode, and a display. The problem that it cannot decompress unless it sticks the base of the problem accompanying the approach of collecting blood by suction, i.e., a cylinder, on the skin, When the cylinder below  $\phi 1.5$  mm is used, blood plugs up a hole. The problem that bleeding will stop, the problem that the structure of a syringe is complicated, etc. are solvable, and a general user cannot need skill, but can collect blood easily and quickly, and can analyze the detected matter.

[0010] Moreover, if the puncture member and electrode in hemanalysis equipment of this invention are made into a cartridge-type, since they can be made throwing away in one, bacterial infection etc. can be prevented. [ arrange / installing the electrode in the hemanalysis equipment of this invention in the location in contact with the blood pressed out by the congestion from the skin, and / furthermore, / in the background of a base prepared possible / sliding / a puncture member ] Since the blood which bled contacts an enzyme and an electrode immediately, it is not necessary to establish a means to contact especially blood to an electrode etc., a series of actuation processes which analysis takes can be reduced, and inspection can be substituted for one-touch.

[0011]

[Example] Hereafter, this invention is explained to a detail with reference to a drawing. The perspective view of hemanalysis equipment with an example of this invention is shown in drawing 1. Moreover, it is drawing 2 (a) about the A-A sectional view of the hemanalysis equipment 1 in drawing 1. It is drawing 2 (b) about a B-B sectional view. It is shown. This hemanalysis equipment 1 has the display material 2 and the blood collecting member 3. The display screen 21, the main switch 22, and the puncture cutting-edge discharge switch 23 are formed in the display material 2, and the display material 2 is pivotable to the blood collecting member 3 (refer to drawing 3).

[0012] On the other hand, the blood collecting member 3 has the binding section 4 and the puncture section 5. The binding section 4 has become cylinder-like and a finger is inserted into this cylinder. The binding member 41 which makes a finger congested is formed in the interior of the binding section 4. Although this binding member 41 may consist of what kind of thing as long as it can make a finger congested, the thing using impregnation of air, the thing using the draw-down of the belt by the drive of a motor etc., etc. can be used like the pressurization band used for measurement of blood pressure, for example.

[0013] As shown in drawing 4, the puncture section 5 has the tabular base 52 held in the sleeve 51 and the sleeve 51. The puncture cutting edge 53 is formed in one base 52 side possible [ sliding ] (refer to drawing 5 (a) and (b)), and it is electrode 54a in an another side side. And electrode lead 54b. It is arranged (refer to drawing 5 (c)). A base 52 has a height 55 and is electrode lead 54b. It extends to this height 55 and is electrode 54a. It forms. Electrode 54a in a height 55 Enzyme ink (not shown) is applied to one side. When various things can be chosen according to the detected matter in blood, for example, it measures the blood sugar level, the ink constituent containing glucose oxidase etc. can be used for enzyme ink. In addition, it is drawing 5 (d) about the perspective view which looked at the base 52 and the puncture cutting edge 53 from back. It is shown.

[0014] This puncture cutting edge 53, a base 52, and a sleeve 51 constitute the dismountable cartridge 6 from a blood collecting member 3. Therefore, it will become very advantageous for reasons of sanitation

by making this cartridge 6 throwing away. The puncture cutting edge 53 is driven with an electromagnet 57 through the arm member 56, and projects from the height 55 of a base 52. An electromagnet 57 is driven by the interaction with the magnet (not shown) installed into the blood collecting member by turning on and off of the puncture cutting-edge discharge switch 23. The flat spring 58 is installed in the base 52, and the puncture cutting edge 53 projected by the arm member 56 is retreated. For the amount of protrusions from the height 55 of the puncture cutting edge 53, the blood (blood drop) which is in the condition which equipped this hemanalysis equipment 1 with the finger, and bled is electrode 54a in a height 55. What is necessary is just to set up so that it can contact. In addition, although the approach of driving the puncture cutting edge 53 using an electromagnet 57 was applied in this example, this invention is not limited to this but can drive the puncture cutting edge 53 by various approaches.

[0015] How to measure the detected matter in blood is explained using the above-mentioned hemanalysis equipment. First, a main switch 22 is turned on and a finger is inserted in the binding member 41. a finger – which finger – you may be – moreover, right and left – you may be which digiti manus. Since the display material 2 is pivotable, when a left finger is inserted with the hemanalysis equipment 1 of this invention, it is drawing 3 (a). Like, when a right finger is inserted, it is drawing 3 (b). It can be made easy to use it, rotating the display material 2 like.

[0016] In this condition, the puncture cutting-edge discharge switch 23 is turned on. If the reusable puncture needle discharge switch 23 is turned on, an electromagnet 57 drives and the puncture cutting edge 53 projects from the height 55 of a base 52 through the arm member 56. The projecting puncture cutting edge 53 returns to the original location according to an operation of a flat spring 58, after damaging the skin of a fingertip. The binding member 41 drives with it, a finger is made congested, and blood is pressed out from the skin which got damaged. The pressed-out blood drop is electrode 54a in a height 55. It contacts, and the detected matter in blood serves as an electrical signal, it is sent to a sensor, and measured value is shown in the display screen 21.

[0017] According to the hemanalysis equipment of such this invention, a series of actuation processes can be reduced and inspection can be substituted for one-touch. Moreover, since this equipment possesses all of a blood collecting device, a puncture member, an electrode, and a display, a general user does not need skill but can use it easily and quickly. Furthermore, with the hemanalysis equipment of this invention, not only the blood sugar level but the various matter in blood can be analyzed by changing the class of enzyme ink to be used.

[0018] As mentioned above, although this invention was explained to the detail using the drawing, this invention can perform various modification, unless it deviates from the thought of this invention, without being limited to this. For example, another example from which the drive of a blood collecting device, a puncture member, an electrode, and a puncture member differs is shown in drawing 6 - drawing 8. As shown in drawing 6, the cartridge 6 consists of a sleeve 51, a blood collecting member 71 of the shape of an rectangular pipe held into the sleeve 51, and a reusable puncture needle 72 that slides on the inside of the blood collecting member 71. In this example, a reusable puncture needle 72 is hammered out with the hammer 82 connected with the spring 81, and projects from the blood collecting member 71. What is necessary is just to establish a means which operates that what is necessary is just to perform actuation of a hammer 82 with a conventional method when the reusable puncture needle discharge switch 5 is pushed. In addition, as shown in drawing 7, the spring 73 for returning root Motobe of a reusable puncture needle 72 the hammered-out reusable puncture needle 72 is installed.

[0019] Two electrodes 92 and 93 are formed in the wall 91 which constitutes the rectangular pipe of the blood collecting member 71, and enzyme ink 94 is applied to one electrode 93 (refer to drawing 8). These electrodes 92 and 93 are connected to a sensor (not shown) through a sleeve 51. The blood collecting member 71 is installed in the location where the blood drop pressed out from the skin contacts, and the centrum 95 of the blood collecting member 71 is set as size in which a blood drop is absorbed by capillarity. The blood collecting member 71 is produced with the ingredient which performs hydrophilic processing to the interior of the blood collecting member 71, or has a hydrophilic property

preferably.

[0020]

[Effect of the Invention] According to this invention, it can collect blood easily by the approach by suction, and blood can be analyzed that it is simple and quickly.

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**MEANS**

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[Means for Solving the Problem] By adopting the blood collecting device in which it has the means which this invention person etc. makes congested in view of the above-mentioned technical problem as a result of wholeheartedly research, even if not based on the suction approach, it could collect blood easily, and a header and this invention were completed for the ability of blood to be analyzed that it is simple and quickly.

[0007] That is, this invention possesses a blood collecting device, a puncture member, an electrode, and a display, and is hemanalysis equipment with which said blood collecting device is characterized by having the means made congested. Moreover, this invention is the above-mentioned hemanalysis equipment characterized by the puncture member and the electrode being a cartridge-type. Furthermore, this invention is the above-mentioned hemanalysis equipment characterized by installing said electrode in the location in contact with the blood which bled in the condition that the body was equipped with hemanalysis equipment.

[0008] The base of a cartridge has tabular, the puncture member is prepared in one side possible [ sliding ], and this invention is the above-mentioned hemanalysis equipment characterized by arranging the electrode in an another side side further again.

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OPERATION

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[0010] Moreover, if the puncture member and electrode in hemanalysis equipment of this invention are made into a cartridge-type, since they can be made throwing away in one, bacterial infection etc. can be prevented. [ arrange / installing the electrode in the hemanalysis equipment of this invention in the location in contact with the blood pressed out by the congestion from the skin, and / furthermore, / in the background of a base prepared possible / -sliding / a puncture member ] Since the blood which bled contacts an enzyme and an electrode immediately, it is not necessary to establish a means to contact especially blood to an electrode etc., a series of actuation processes which analysis takes can be reduced, and inspection can be substituted for one-touch.

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EXAMPLE

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[0012] On the other hand, the blood collecting member 3 has the binding section 4 and the puncture section 5. The binding section 4 has become cylinder-like and a finger is inserted into this cylinder. The binding member 41 which makes a finger congested is formed in the interior of the binding section 4. Although this binding member 41 may consist of what kind of thing as long as it can make a finger congested, the thing using impregnation of air, the thing using the draw-down of the belt by the drive of a motor etc., etc. can be used like the pressurization band used for measurement of blood pressure, for example.

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[0014] This puncture cutting edge 53, a base 52, and a sleeve 51 constitute the dismountable cartridge 6 from a blood collecting member 3. Therefore, it will become very advantageous for reasons of sanitation by making this cartridge 6 throwing away. The puncture cutting edge 53 is driven with an electromagnet 57 through the arm member 56, and projects from the height 55 of a base 52. An electromagnet 57 is driven by the interaction with the magnet (not shown) installed into the blood collecting member by turning on and off of the puncture cutting-edge discharge switch 23. The flat spring 58 is installed in the base 52, and the puncture cutting edge 53 projected by the arm member 56 is retreated. For the amount of protrusions from the height 55 of the puncture cutting edge 53, the blood (blood drop) which is in the condition which equipped this hemanalysis equipment 1 with the finger, and bled is electrode 54a in a height 55. What is necessary is just to set up so that it can contact. In addition, although the approach of driving the puncture cutting edge 53 using an electromagnet 57 was applied in this example, this invention is not limited to this but can drive the puncture cutting edge 53 by various approaches.

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[0017] According to the hemanalysis equipment of such this invention, a series of actuation processes can be reduced and inspection can be substituted for one-touch. Moreover, since this equipment possesses all of a blood collecting device, a puncture member, an electrode, and a display, a general user does not need skill but can use it easily and quickly. Furthermore, with the hemanalysis equipment of this invention, not only the blood sugar level but the various matter in blood can be analyzed by changing the class of enzyme ink to be used.

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[0019] Two electrodes 92 and 93 are formed in the wall 91 which constitutes the rectangular pipe of the blood collecting member 71, and enzyme ink 94 is applied to one electrode 93 (refer to drawing 8). These electrodes 92 and 93 are connected to a sensor (not shown) through a sleeve 51. The blood collecting member 71 is installed in the location where the blood drop pressed out from the skin contacts, and the centrum 95 of the blood collecting member 71 is set as size in which a blood drop is absorbed by capillarity. The blood collecting member 71 is produced with the ingredient which performs hydrophilic processing to the interior of the blood collecting member 71, or has a hydrophilic property preferably.

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing an example of the hemanalysis equipment of this invention.

[Drawing 2] (a) The A-A sectional view of the hemanalysis equipment in \*\*\*\*1 is shown, and it is (b). A B-B sectional view is shown.

[Drawing 3] (a) It is drawing showing the condition of having equipped with the left finger to the hemanalysis equipment of \*\*\*\*\*, and (b) is drawing showing the condition of having equipped with the right finger.

[Drawing 4] It is drawing showing an example of the drive of the cartridge in the hemanalysis equipment of this invention, and a puncture member.

[Drawing 5] It is drawing showing the base and puncture cutting edge of a cartridge in the hemanalysis equipment of this invention. (a) It is drawing seen from the \*\*\*\*\* side, and is (b). It is drawing showing the condition that the puncture cutting edge projected, and is (c). It is drawing seen from the electrode side, and is (d). It is drawing seen from back.

[Drawing 6] It is drawing showing other examples of the drive of the cartridge in the hemanalysis equipment of this invention, and a puncture member.

[Drawing 7] It is drawing showing the blood collecting member and reusable puncture needle in hemanalysis equipment of this invention.

[Drawing 8] It is drawing showing the condition that the blood collecting member in the hemanalysis equipment of this invention decomposed.

### [Description of Notations]

- 1 - Hemanalysis equipment 2 - Display material
  - 21 - Display screen 22 - Main switch
  - 23 - Puncture cutting-edge discharge switch 3 - Blood collecting member
  - 4 - Binding section 41 - Binding member
  - 5 - Puncture section 51 - Sleeve
  - 52 - Base 53 - Puncture cutting edge
  - 54a - Electrode 54b - Electrode lead
  - 55 - Height 56 - Arm member
  - 57 - Electromagnet 58 - Flat spring
  - 6 - Cartridge 71 - Blood collecting member
  - 72 - Reusable puncture needle 73 81 - Spring
  - 82 - Hammer 91 - Wall
  - 92 93 - Electrode 94 - Enzyme ink
  - 95 - Centrum
-



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**\* NOTICES \***

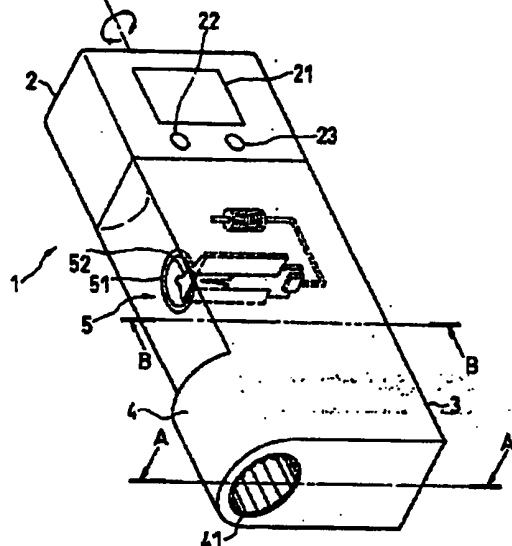
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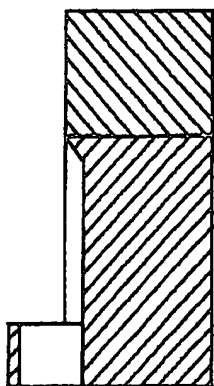
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**DRAWINGS**

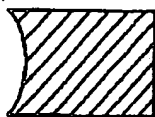
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[Drawing 1][Drawing 2]

(a)

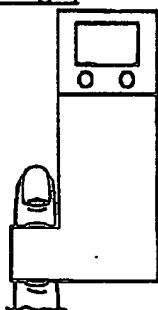


(b)

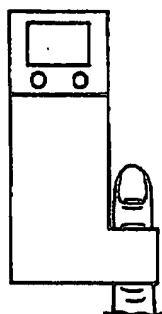


[Drawing 3]

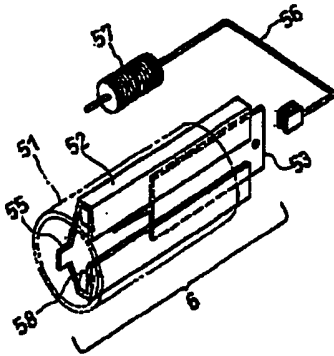
(a)



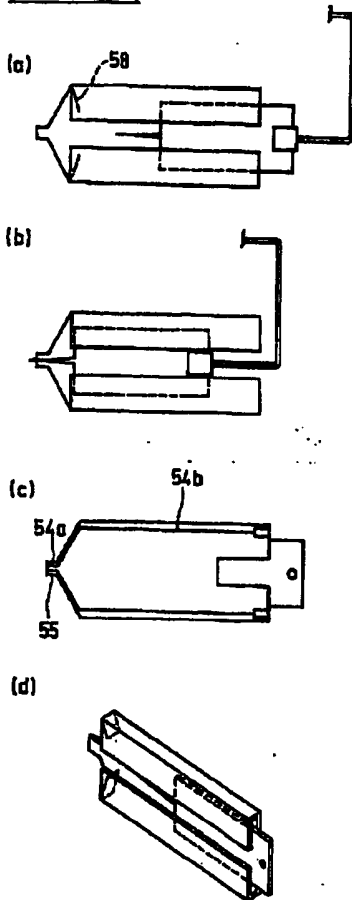
(b)



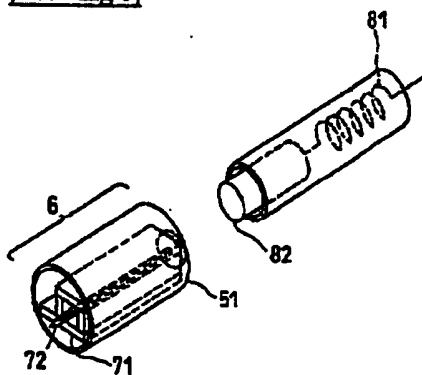
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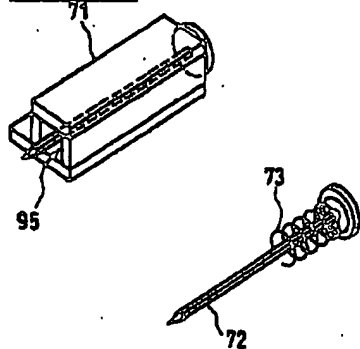
[Drawing 5]



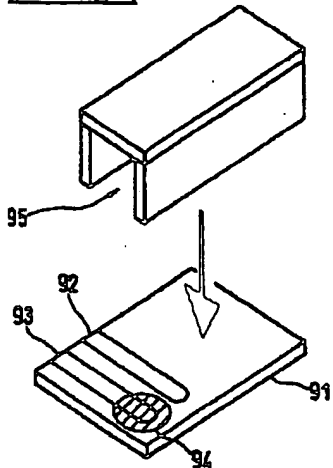
[Drawing 6]



[Drawing 7]



[Drawing 8]



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[Translation done.]

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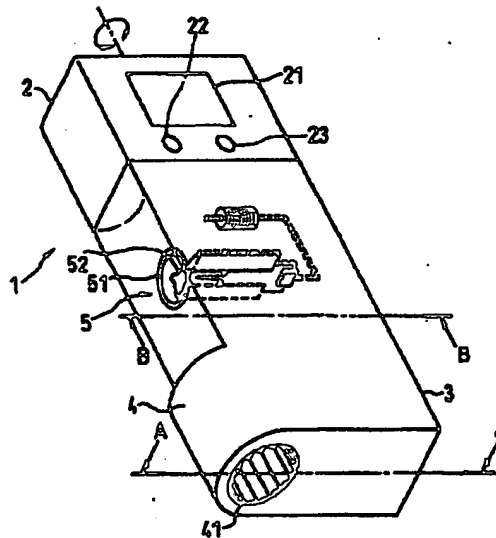
最良図に就く

(54) 【発明の名称】 血液分析装置

(57) 【要約】

【解決手段】 採血機構、穿刺部材、電極及び表示部を具備し、前記採血機構が、吸血させる手段を有することを特徴とする血液分析装置。

【効果】 吸引によらない方法で容易に採血でき、血液の分析を簡便にかつ迅速に行うことができる。



## 【特許請求の範囲】

【請求項1】 採血機構、穿刺部材、電極及び表示部を具備し、前記採血機構が、鬱血させる手段を有することを特徴とする血液分析装置。

【請求項2】 前記穿刺部材及び電極がカートリッジ式になっていることを特徴とする、請求項1記載の血液分析装置。

【請求項3】 血液分析装置が人体に装着された状態において、出血した血液に接触する位置に前記電極が設置されていることを特徴とする、請求項1又は2記載の血液分析装置。

【請求項4】 カートリッジの基体が板状になっており、一方の側に穿刺部材が摺動可能に設けられており、他方の側に電極が配設されていることを特徴とする、請求項2又は3記載の血液分析装置。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は血糖値等、血液中に含まれる被検知物質を分析することのできる血液分析装置に関し、特に採血機構、穿刺部材、電極及び表示部をすべて具備した血液分析装置に関する。

## 【0002】

【従来の技術】従来より、血糖値等を測定する場合には、穿刺器具（ランセット）を用いて指先に傷を付け、そこから血滴を絞り出し、包材より取り出してセンサーに装着した電極にその血滴を付着させることにより行っていた。しかしながら、このように穿刺器具とセンサーが分離していると、一連の操作を行うにあたって要する過程が多い。

【0003】そこで、穿刺針、毛細管及びセンサーが一体になった医療用システム（特開昭61-286738号公報参照）、穿刺針、吸引具及び血溜体が一体になった採血器（特開平5-111476号公報、特開平6-311980号公報、特開平6-327655号公報、特開平7-51251号公報参照）ならびに穿刺針、吸引具、血溜体及びセンサーが一体になった採血器（特開平5-95937号公報、特開平5-95938号公報参照）が提案された。

【0004】しかしながら、これらの器具における採血方法は、いずれも注射器やスポイト等により減圧して血液を吸引する方式によるものであり、前者ではシリンダーの底面を皮膚に密着させないと減圧することができず、 $\phi 1.5$  mm以下のシリンダーを使用した場合には血液が穴を塞いでしまい、出血が停止してしまう等の欠点があり、後者ではスポイトの構造が複雑である等の欠点があった。

## 【0005】

【発明が解決しようとする課題】本発明の課題は、吸引によらない方法で採血する機構を有し、穿刺部材、電極及び表示部を具備した便利な血液分析装置を提供することである。

## 【0006】

【課題を解決する手段】上記課題に鑑み鋭意研究の結果、本発明者等は、鬱血させる手段を有する採血機構を採用することにより、吸引方法によらずとも容易に採血することができ、血液の分析を簡便にかつ迅速に行うことができることを見出し、本発明を完成した。

【0007】即ち、本発明は、採血機構、穿刺部材、電極及び表示部を具備し、前記採血機構が、鬱血させる手段を有することを特徴とする血液分析装置である。また、本発明は、穿刺部材及び電極がカートリッジ式になっていることを特徴とする上記血液分析装置である。さらに、本発明は、血液分析装置が人体に装着された状態において、出血した血液に接触する位置に前記電極が設置されていることを特徴とする上記血液分析装置である。

【0008】さらにまた、本発明は、カートリッジの基体が板状になっており、一方の側に穿刺部材が摺動可能に設けられており、他方の側に電極が配設されていることを特徴とする上記血液分析装置である。

## 【0009】

【作用】鬱血させる手段で採血する機構を有し、穿刺部材、電極及び表示部を具備した本発明の血液分析装置では、吸引により採血する方法に伴う問題、即ちシリンダーの底面を皮膚に密着させないと減圧することができないという問題、 $\phi 1.5$  mm以下のシリンダーを使用した場合に血液が穴を塞いでしまい、出血が停止してしまうという問題、スポイトの構造が複雑であるという問題等を解決することができ、一般ユーザーが熟練を必要とせず、容易かつ迅速に採血し、被検知物質を分析することができる。

【0010】また、本発明の血液分析装置における穿刺部材及び電極をカートリッジ式にすれば、それらを一体的に使い捨てにすることができるため、細菌の感染等を防止することができる。さらに、本発明の血液分析装置における電極を、鬱血により皮膚から絞り出された血液に接触する位置に設置すること、穿刺部材が摺動可能に設けられた基体の裏側に配設することにより、出血した血液がすぐさま酵素及び電極に接触するため、特に血液を電極等に接触させる手段を設ける必要がなく、分析に要する一連の操作過程を減らし、ワンタッチで検査を済ませることができる。

## 【0011】

【実施例】以下、図面を参照して本発明を詳細に説明する。本発明の一例による血液分析装置の斜視図を図1に示す。また、図1における血液分析装置1のA-A断面図を図2(a)に、B-B断面図を図2(b)に示す。この血液分析装置1は、表示部材2と、採血部材3とを有する。表示部材2には、表示画面21、メインスイッチ22及び穿刺刃発射スイッチ23が設けられており、表示部材2は採血部材3に対して回転可能となっている（図3参



照)。

【0012】一方、採血部材3は採血部4及び穿刺部5を有する。採血部4は円筒状になっており、この円筒の中に指が挿入される。採血部4の内部には、指を吸血させる採血部材41が設けられている。この採血部材41は、指を吸血させることができるものであれば、いかなるものからなってもよいが、例えば血圧の測定に用いられる加圧帯のように、空気の注入を利用するものや、モーター等の駆動によるベルトの締め付けを利用するもの等を用いることができる。

【0013】図4に示すように、穿刺部5はスリーブ51、及びスリーブ51に収容された板状の基体52を有する。基体52の一方の側には、穿刺刃53が駆動可能に設けられており(図5(a)及び(b)参照)、他方の側には電極54a及び電極リード54bが配設されている(図5(c)参照)。基体52は突起部55を有し、電極リード54bがこの突起部55まで延在し、電極54aを形成する。突起部55における電極54aの一方には、酵素インキ(図示せず)が塗布されている。酵素インキは、血液中の被検知物質に応じて種々のものを選択することができ、例えば血糖値を測定する場合には、グルコースオキシダーゼ等を含むインキ組成物を用いることができる。なお、基体52及び穿刺刃53を後方から見た斜視図を図5(d)に示す。

【0014】この穿刺刃53、基体52及びスリーブ51は、採血部材3から取り外し可能なカートリッジ6を構成する。従って、このカートリッジ6を使い捨てにすることにより、衛生上非常に有利なものとなる。穿刺刃53はアーム部材56を介して電極石57によって駆動され、基体52の突起部55から突出する。電極石57は、穿刺刃駆動スイッチ23のオン・オフによって、採血部材中に設置された磁石(図示せず)との相互作用で駆動される。基体52には板バネ58が設けられており、アーム部材56によって突出された穿刺刃53を後退させる。穿刺刃53の突起部55からの突出は、指を本血液分析装置1に装着した状態で、出血した血液(血滴)が突起部55における電極54aに接触し得るように設定すればよい。なお、本実施例では電極石57を用いて穿刺刃53を駆動する方法を適用したが、本発明はこれに限定されず、種々の方法によって穿刺刃53を駆動することができる。

【0015】上記血液分析装置を用いて、血液中の被検知物質を測定する方法を説明する。まず最初に、メインスイッチ22を入れ、採血部材41に指を挿入する。指はいずれの指であってもよく、また左右どちらの手の指であってもよい。本発明の血液分析装置1では、表示部材2は回転可能であるため、左手の指を挿入したときは図3(a)のように、また右手の指を挿入したときは図3(b)のように表示部材2を回転させて、使用し易くすることができる。

【0016】この状態で、穿刺刃駆動スイッチ23を入れる。穿刺刃駆動スイッチ23が入ると、電極石57が駆動

し、アーム部材56を介して穿刺刃53が基体52の突起部55から突出する。突出した穿刺刃53は指先の皮膚を傷付けた後、板バネ58の作用により元の位置に戻る。それとともに採血部材41が駆動し、指を吸血させ、傷ついた皮膚から血液を絞り出す。絞り出された血滴は突起部55における電極54aに接触し、血中の被検知物質が電気信号となってセンサーに送られ、測定値が表示画面21に示される。

【0017】このような本発明の血液分析装置によれば、一連の操作過程を短らし、ワンタッチで検査を済ませることができる。また、本装置は採血部材、穿刺部材、電極及び表示部を全て具備しているため、一般ユーザーが点検を必要とせず、容易かつ迅速に使用することができる。さらに、本発明の血液分析装置では、使用する酵素インキの種類を変えることにより、血糖値のみならず、種々の血中物質の分析を行うことができる。

【0018】以上、図面を用いて本発明を詳細に説明したが、本発明はこれに限定されることなく、本発明の思想を逸脱しない限り、種々の変更を施すことができる。例えば、採血部材、穿刺部材、電極及び穿刺部材の駆動機構が異なる別の実施例を図6～図8に示す。図6に示すように、カートリッジ6は、スリーブ51と、スリーブ51の中に収容された角筒状の採血部材71と、採血部材71の中を駆動する穿刺針72とから構成されている。本実施例では、穿刺針72は、バネ81に連結したハンマー82によって打ち出され、採血部材71から突出する。ハンマー82の動作は常法によって行えばよく、穿刺針駆動スイッチ5を押した際に動作するような手段を設ければよい。なお、図7に示すように、穿刺針72の根元部には、打ち出された穿刺針72を戻すためのバネ73が設けられている。

【0019】採血部材71の角筒を構成する壁部91には2つの電極92、93が設けられており、一方の電極93には酵素インキ94が塗布されている(図8参照)。この電極92、93は、スリーブ51を介してセンサー(図示せず)に接触される。採血部材71は、皮膚から絞り出された血滴が接触する位置に設置され、採血部材71の中空部95は、血滴が毛細管現象により吸い込まれるようなサイズに設定される。好ましくは、採血部材71の内部に保水処理を施すか、保水性を有する材料により採血部材71を作製する。

【0020】

【発明の効果】本発明によれば、吸引によらない方法で容易に採血でき、血液の分析を簡便にかつ迅速に行うことができる。

【図面の簡単な説明】

【図1】本発明の血液分析装置の一例を示す斜視図である。

【図2】(a)は図1における血液分析装置のA-A断面図を示し、(b)はB-B断面図を示す。

【図3】(a)は本発明の血液分析装置に左手の指を装着

した状態を示す図であり、(b)は右手の指を装着した状態を示す図である。

【図4】本発明の血液分析装置におけるカートリッジ及び穿刺部材の駆動機構の一例を示す図である。

【図5】本発明の血液分析装置におけるカートリッジの基体及び穿刺刃を示す図である。(a)は穿刺刃側から見た図であり、(b)は穿刺刃が突出した状態を示す図であり、(c)は電極側から見た図であり、(d)は後方から見た図である。

【図6】本発明の血液分析装置におけるカートリッジ及び穿刺部材の駆動機構の他の例を示す図である。

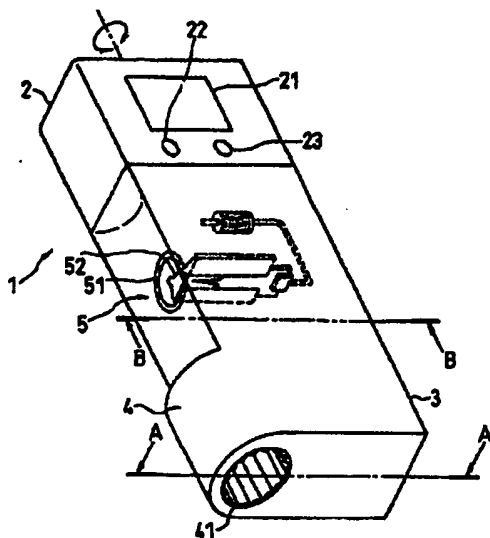
【図7】本発明の血液分析装置における採血部材及び穿刺針を示す図である。

【図8】本発明の血液分析装置における採血部材の分解した状態を示す図である。

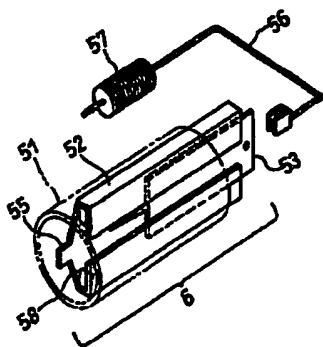
【符号の説明】

- |              |            |
|--------------|------------|
| 1…血液分析装置     | 2…表示部材     |
| 21…表示画面      | 22…メインスイッチ |
| 23…穿刺刃発射スイッチ | 3…採血部材     |
| 4…緊締部        | 41…緊締部材    |
| 5…穿刺部        | 51…スリーブ    |
| 52…基体        | 53…穿刺刃     |
| 54a…電極       | 54b…電極リード  |
| 55…突起部       | 56…アーム部材   |
| 57…電磁石       | 58…板バネ     |
| 6…カートリッジ     | 71…採血部材    |
| 72…穿刺針       | 73, 81…バネ  |
| 82…ハンマー      | 91…壁部      |
| 92, 93…電極    | 94…酵素インキ   |
| 95…中空部       |            |

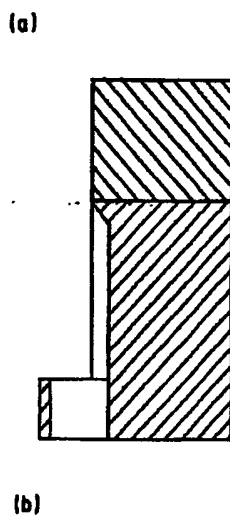
【図1】



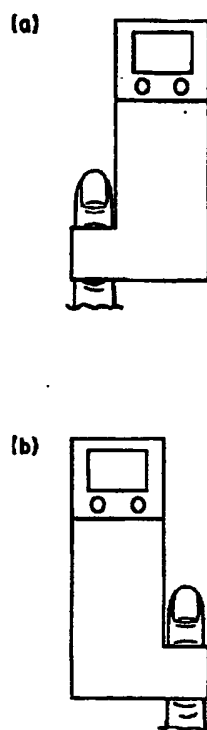
【図4】



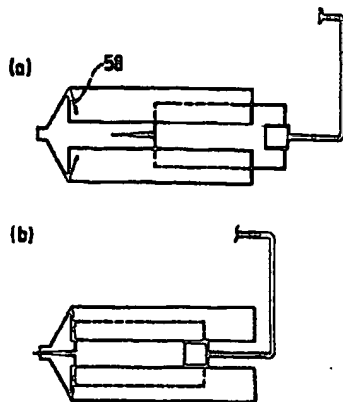
【図2】



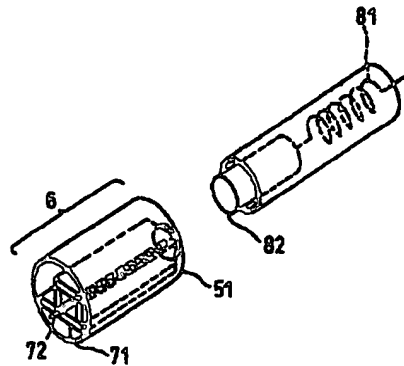
【図3】



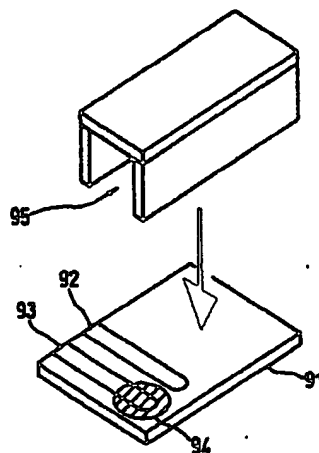
【図5】



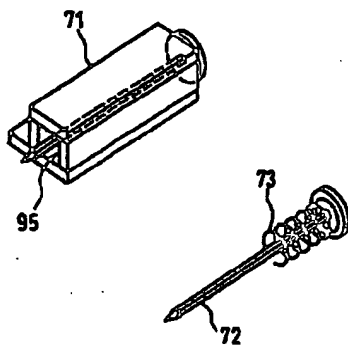
【図6】



【図8】



【図7】



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大日本印刷株式会社内

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